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PLANETARY PHENOMENA FOR NOVEMBER AND DECEMBER 1917

BY MALCOLM MCNEILL

PHASES OF THE MOON, PACIFIC TIME.

Last Quarter..	Nov. 6,	9^h 3^m A.M.	Last Quarter...	Dec. 6,	6^h 14^m A.M.
New Moon....	" 14,	10 28 A.M.	New Moon....	" 14,	1 17 A.M.
First Quarter..	" 21,	2 29 P.M.	First Quarter...	" 20,	10 7 P.M.
Full Moon....	" 28,	10 41 A.M.	Full Moon.....	" 28,	1 52 A.M.

The sixth eclipse of the year is *an annular eclipse of the Sun* on the morning of Dec. 14th Pacific Time. It will be visible only in regions far south of the equator, the line of central eclipse passing very close to the South Pole. The only inhabited lands from which it can be seen even as a partial eclipse are on the southeast coast of South America and the southern part of Australia.

The seventh and last eclipse of the year is *a total eclipse of the Moon* on the morning of Dec. 28th. It will be visible throughout the United States, the principal circumstances being as follows, Pacific Time:

Moon enters shadow...........	Dec. 28,	12^h 5^m A.M.
Total eclipse begins.............	" 28,	1 38 A.M.
Middle of the eclipse...........	" 28,	1 46 A.M.
Total eclipse ends..............	" 28,	1 55 A.M.
Moon leaves shadow...........	" 28,	3 27 A.M.

The duration of totality, only 17 minutes, is very short.

The Sun reaches the solstice and winter begins December 22nd, 1^h 46^m A. M. Pacific Time.

Mercury passes superior conjunction and becomes a morning star on November 3rd. It will remain such until after the close of the year. The Sun and planet separate rather slowly until December 1st, their distance being too small for naked eye visibility; but after that date the separation is more rapid and greatest east elongation, 20° 20′, is reached on December 16th. The planet then remains above the horizon for about an hour and twenty minutes after sunset. It is therefore in fair position for evening observation on this date and for a week or so before and after; but Sun and planet soon begin to approach each other rapidly so that by the end of the month the planet has nearly reached inferior conjunction. The planet's apparent motion among the stars is, during the latter half of December, relatively rapid, as it is in perihelion on December 29th.

Venus is an evening star, attaining its greatest east elongation, 47° 18′, from the Sun November 29th, and during December will draw about 5° nearer, but on account of the relative northward motion of the planet the interval between the setting of the Sun and of the planet will not begin to shorten until late in December. On December 1st it remains above the horizon a little more than three hours after sunset, and during the latter half of the month a half an hour more. During the two months it moves 61° eastward and 12° northward thru *Sagittarius* into the eastern part of *Capricorn*. It will be in conjunction with *Uranus* on December 30th, passing 0° 35′, a distance a little more than the apparent diameter of the Moon, north of the latter. As the planet's actual distance from the Earth is diminishing rapidly its brightness will increase greatly, so that by the end of December it will nearly reach its maximum.

Mars rises on November 1st shortly before 1 A. M. and on December 31st just after 11 P. M. During the two months it moves eastward 26° and southward 10° from a point near the first magnitude star *Regulus* thru *Leo* into *Virgo*. On December 26th it passes about 2° north of the fourth magnitude star *β Virginis*. Its actual distance from the Earth has begun to diminish quite rapidly and at the end of December is not much more than the Sun's mean distance from the Earth, and is only one half of its distance from the Earth last April. It is consequently four times as bright as it was then, and therefore considerably brighter than the average first magnitude star.

Jupiter is in fine position for observation since it comes to opposition with the Sun on November 28th, and is then above the horizon the entire night. On November 1st it rises at a little before 7 P. M., and at the end of December it does not set until 4:30 A. M. During the two months it retrogrades, moves westward, 7° and southward 1° from a position about 5° north of *Aldebaran*, the brightest star in *Taurus*.

Saturn rises half an hour before midnight on November 1st, and at about half after seven on December 31st. It is therefore getting into fair position for evening observation. It moves slowly eastward, 0° 35′ up to November 26, and then moves westward about one degree. It is in the extreme eastern part of *Cancer* and is about 14° west and north of *Regulus*, the brightest star in *Leo*. As seen in the telescope the minor axis of the rings is about one quarter of the major axis.

Uranus can still be found in the southwestern sky in the evening but toward the end of the year it sets rather early, shortly after

8 P. M., for easy naked eye observation. On November 1st it sets shortly before midnight, and can then be easily found until after 10 P. M. Its retrograde motion ceased at the end of October, and it now moves eastward almost exactly retracing its path; so that at the end of December it is in about the same place as it was toward the end of August. It can therefore be identified by its proximity to the same two stars, δ and γ *Capricorni*, which have served as markers all summer and autumn. At the end of December it is just about 2° north of γ, the fainter and right hand one of the two stars. Its motion during the two months has been somewhat more than 1° eastward. The conjunction of *Venus* and *Uranus* on December 30th has already been mentioned.

Neptune on November 1st, rises shortly before 11 P. M. and shortly before 7 P. M. on December 31st. It is in the constellation *Cancer*.